Active Project (2016 - 2018)

Autonomous Agricultural Application using Unmanned Aircraft, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

Interest in Unmanned Aircraft Systems (UAS) for civilian use has increased greatly in recent years and is expected to grow significantly in the future. NASA is involved in research that would greatly benefit from advancing the ability of UAS to make autonomous real-time decisions based on sensor data. This SBIR effort will provide this capability, developing and demonstrating an intelligent controller for a UAS that can autonomously perform agricultural chemical spraying leveraging EPA-approved software and following NASA guidelines for suggested certification requirements for commercial UAS over 55 lbs. This is a high-value civilian application well-suited to autonomous UAS given the dangers posed by maneuvering manned aircraft at extremely low altitudes. This also serves as a test case for evaluating future UAS certification requirements. Phase I established feasibility by demonstrating the ability to perform the required onboard sensing, to establish communication between a UAS and flight controller at high enough bandwidth to allow inflight decision-making, and to execute a pre-determined flight path/spraying strategy autonomously. Phase II would see the design, development and implementation of a fully-autonomous, prototype system that can perform high-level decision-making during flight and satisfy NASA's draft certification basis for UAS performing precision agricultural spraying. The prototype system would install algorithms based upon existing EPA-approved spray drift management software within the autonomous flight control system. The end goal of the Phase II effort would be a flight demonstration of the prototype system consisting of a modified, midsize UAS spraying intelligently and autonomously, with high-level decision-making, within a relevant environment.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The proposed effort

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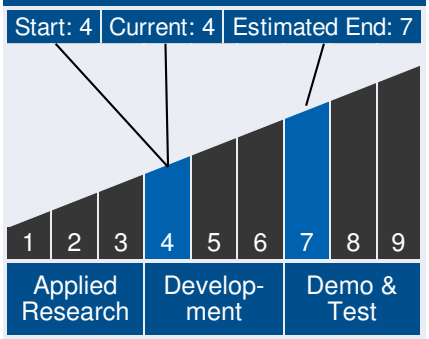
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

directly addresses NASA program goals to develop technologies that provide the ability of UAS to extract information in-flight and utilize this information in decision making. This SBIR effort also directly supports current NASA/industry initiatives to establish airworthiness standards for FAA-certification that will provide a roadmap for future application of UAS in commercial applications within the United States. Specifically, this SBIR effort dovetails with a NASA/DPI partnership to study civil airworthiness certification for use in the national airspace through demonstration of precision agricultural spray application, a mission that is particularly suited to UAS given the significant dangers faced by manned aircraft maneuvering at extremely low altitudes. The proposed SBIR effort complements and directly supports this NASA/DPI effort by demonstrating fully-autonomous, flight path and mission management system for UAS tailored toward a specific task, in this case agricultural spraying. The proposed project addresses two key elements that must be demonstrated before UAS can be applied in commercial missions within the U.S; a need for technical advancement related to autonomous control and decision-making and a need to develop airworthiness FAA-certification requirements for UAS operations.

To the commercial space industry:

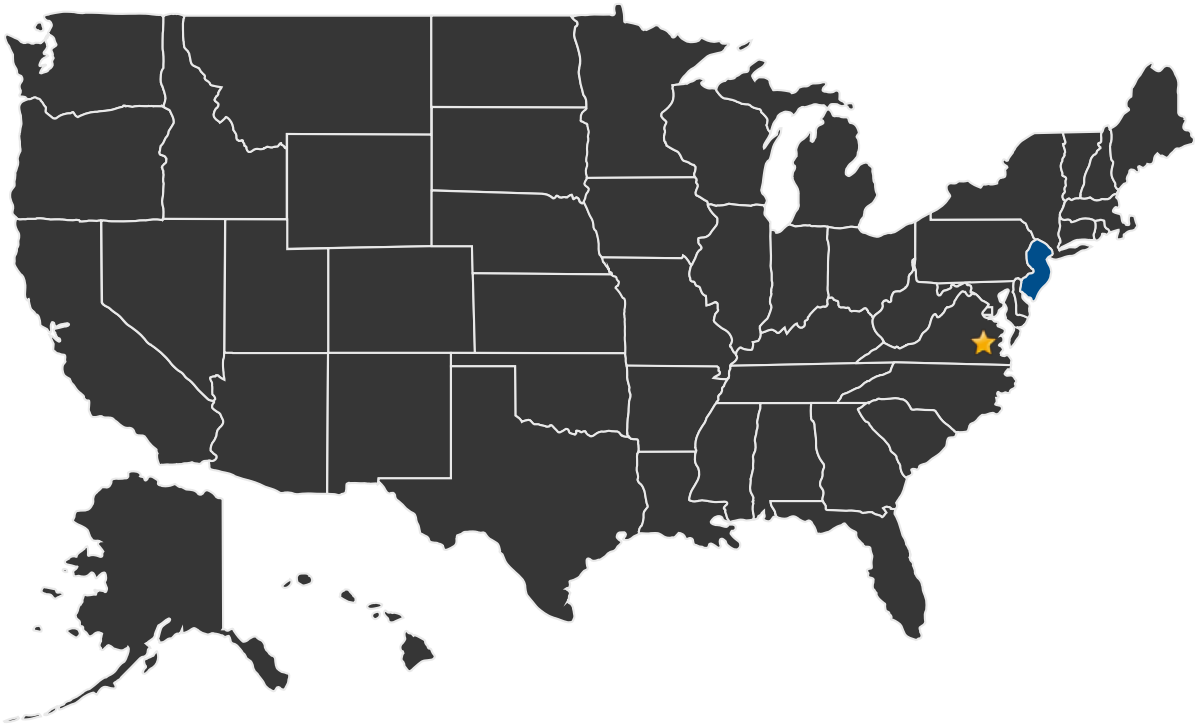
Potential Non-NASA Commercial Applications: The DoD is seeing growing use of UAS in surveillance and urban operations where the ability to extract information in-flight and utilize this information in decision-making with minimal human oversight is critical. The number of trained operators of DoD unmanned aircraft systems is currently being vastly outstripped by requirements for operating an ever-increasing fleet of UAS aircraft. UAS operators are currently being forced to work longer and longer shifts with no alleviation in sight. The technology developed during this effort directly supports addressing this need, providing advancements in the ability for autonomous control of UAS platforms that will reduce the level of direct piloting required. Private industry will also benefit greatly from

Management Team *(cont.)*

Principal Investigator:
- Daniel Wachspress

this current effort. First, this SBIR will provide advancements in fully-autonomous, application-specific, UAS platforms. Autonomous control is critical to the eventual expansion of the customer base beyond those with piloting experience to the general public at large. Thus this area of research supports an enormous leap in commercialization potential. Second, the proposed effort also has a component addressing FAA-certification requirements for autonomously-controlled UAS. This is currently a critical barrier to the commercial use of UAS in the U.S.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Continuum Dynamics, Inc. (Ewing, NJ)

Autonomous Agricultural Application using Unmanned Aircraft, Phase II Project

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23510)

IMAGE GALLERY

Autonomous Agricultural Application using Unmanned Aircraft, Phase II

DETAILS FOR TECHNOLOGY 1

Technology Title

Autonomous Agricultural Application using Unmanned Aircraft, Phase II

Potential Applications

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